level of the platinum wire. By aid of a totally reflecting prism, like that of the prismatic azimuth compass, with one side convex, the user of the instrument looking downwards sees when the black line on the end of the needle is exactly level with the score on the glass plate. This mode of sighting has proved very satisfactory; it is very easily and quickly used, and it is so sensitive that with the dimensions and magnetic power of the instrument before you it shows easily a variation of vertical force amounting to $\frac{1}{100}$ of the earth's vertical force in this locality. The accompanying printed instructions for the adjustment of my compass describe in sufficient detail the way of using it for correcting the heeling error.

In the instrument before you there is a divided paper circle in the bottom of the box to serve as a "dumb card," to be used with the azimuth mirror when there may be occasion for the use of a non-magnetic azimuth instrument. This appliance has nothing to do with the dipping needle, and is introduced because, while adding little or nothing to the cumbrousness of the instrument, it saves the adjuster the necessity for carrying a separate azimuth instrument with him.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—From the University Calendar for 1878 we learn that the Undergraduates, who were last year 2,590, have now risen to 2,659, while the members of Convocation have increased from 4,870 to 5,026. During the year 320 have taken the degree of Master of Arts, and 446 that of Bachelor of Arts. The number of matriculations, which in 1868 was 579, and which in 1876 was 650, rose in 1877 to 770. But this increase was due to the number of candidates for a musical degree. The list of members of Congregation—that is, of the legislative body of resident members of Convocation—has increased, but only slightly. In 1876 they numbered 314; in 1877, 322. But the proportion between clergymen and laymen has considerably changed during the year. In 1876 there were 180 clergymen and 134 laymen; in 1877 the laymen have risen to 154, and the clergymen have fallen to 168. Of the whole body of Fellows (exclusive of Christ Church), resident and non-resident, there are at present 192 laymen and 116 clergymen.

CAMBRIDGE.—The Council of the Senate having had under consideration a letter from Prof. Hughes, Woodwardian Professor of Geology, representing the need for additional assistance, propose that an assistant be appointed, with a stipend of 200*l.* per annum, whose duties shall be to assist the Professor in the arrangement and care of the geological collections, to give such instruction and demonstrations as may be required, and to assist students making use of the museum. It is proposed to vest the appointment in the Professor, with the consent of the Vice-Chancellor.

EDINBURGH.—A site has been secured in Chambers Street, close by the University, for the erection of a new school of medicine for extra-academical teachers, on the spot formerly occupied by Minto House, so long the scene of the demonstrations and prelections of eminent extra-mural lecturers.

TAUNTON COLLEGE SCHOOL.—A microscopic cabinet by Smith and Beck, with other valuable apparatus, has been presented to the Rev. W. Tuckwell by his late assistant-masters at the Taunton College School, as an expression of their personal sympathy and their recognition of the services rendered by him to the higher education.

PRUSSIA.—January 20 was a red letter day for a number of professors in Prussian universities, no less than fifteen receiving orders of different ranks from the Emperor William.

DRESDEN.—On May 1 the Royal Polytechnic Institution at Dresden will celebrate the fiftieth anniversary of its foundation. Originally confined to the narrowest limits, the Institution has rapidly developed, and is now one of the most frequented polytechnic schools of Germany.

GREIFSWALD.—The attendance on the university shows a decrease as compared with the past summer. The students number 43 in the theological faculty, 73 in the legal, 126 in the philosophical, and 218 in the medical. The corps of professors and privat-docenten is at present 60. A library of 60,000 volumes, well equipped laboratories and collections, and ample revenues place Greifswald on a par with most German universities, but for a number of years it has failed singularly to compete in point of attendance with many poorer centres of study.

TÜBINGEN.—The university shows at present the highest winter attendance since its foundation. The students are divided as follows: Theology (evangelical), 215, (catholic), 108; law, 256; natural sciences and medicine, 222; philosophy, 145.

MÜNSTER.—Prof. R. Sturm, of the Darmstadt Polytechnic, has been appointed to the chair of mathematics, rendered vacant by the late death of Prof. Heis. The number of students at present is 312.

BERLIN.—Prof. Schwedener, of Tübingen, has received a call to Berlin to fill the second professorship for Botany lately created at the University.

VIENNA.—In the lately presented educational budget of Austria the sum of 50,000*l.* is appropriated for the erection of new buildings for the Vienna University.

DORPAT.—The hitherto rigorous rule of Russian universities requiring from all instructors the possession of Russian diplomas of the doctorate, &c., has been modified in the case of Dorpat, recognition being made of foreign degrees and professorial positions.

SIBERIA.—The Imperial Commission appointed to settle the long-debated question as to the University of Siberia, has definitively given the preference to Tomsk, against Omsk. We are glad to learn this result, because of the central position of Tomsk, its larger population, not exclusively administrative, as at Omsk, and the larger number of secondary schools. Several Siberian merchants have endowed the future University with considerable sums of money.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 31.—"On the Expression of the Product of any Two Legendre's Coefficients by means of a Series of Legendre's Coefficients," by Prof. J. C. Adams, F.R.S.

Royal Society, February 24.—"On the Use of the Reflection Grating in Eclipse Photography," by J. Norman Lockyer, F.R.S.

The results obtained by the Eclipse Expedition to Siam have led me to think that, possibly, the method of using the coronal atmosphere as a circular slit, suggested by Prof. Young and myself, for the Indian eclipse of 1871, might be applied under very favourable conditions, if the prism or train of prisms hitherto employed were replaced by one of those reflection gratings with which the generosity of Mr. Rutherfurd has endowed so many of our observers.

To test this notion I have made some experiments with a grating, which I owe to Mr. Rutherfurd's kindness, containing 17,280 lines to the inch. The results of these observations I have now the honour of laying before the Royal Society.

In front of the lens of an ordinary electric lamp, which lens was adjusted to throw a parallel beam, I have introduced a circular aperture, cut in cardboard, forming an almost complete ring, some two inches in interior diameter, the breadth of the ring being about $\frac{1}{8}$ inch. This was my artificial eclipse.

At a distance from the lamp of about thirteen yards, I mounted a $3\frac{3}{4}$ inch Cooke telescope, of fifty-four inches focal length. Some distance short of this focus I placed Mr. Rutherfurd's grating, and, where the first order spectrum fell, I placed a focussing screen. To adjust for sharp focus, in the first instance, the grating was so inclined to the axis of the telescope that the image of the ring reflected by the silver surface adjacent to the grating was thrown on to the screen. This done, the grating was placed at right angles to the axis, and the spectrum of the circular slit, illuminated by sodium vapour and carbon vapour, photographed for the first, second, and third orders on one side. The third order spectrum, showing the exquisite rings due to the carbon vapour flutings was produced in forty-two seconds. The first order spectrum, also submitted to the Society, was produced in the same period of time, and was very much over-exposed; it is, therefore, I think not expecting too much that we should be able to take a photograph of the eclipse, in the third order, in two minutes; but let us make it four. Similarly, we may hope for a photograph of the second order in two minutes, and it is, I think, highly probable also that a photograph of the first order may be obtained in one minute.

It is clear then that, by mounting photographic plates on both sides of the axis, one solidly mounted equatorial of short focal length may enable us to obtain a large number, with varying lengths of exposure, of the next eclipse. I have insisted upon the solidity of the mounting because, if any one plate is to be exposed during the whole of totality, the instrument must not be violently disturbed or shaken while the eclipse is going on. I think, however, it is quite possible to obtain many photographs, of the lower order spectra, without any such disturbance. The same plate may be made to record three, or even four, exposures in the case of the first order, by merely raising or lowering it after a given time, so that a fresh portion of the same plate may be exposed, by means of a rapid screw or other equivalent contrivance. Similarly, the plates on which the spectra of the second order are to be recorded may be made to perform double duty.

Linnean Society, February 7.—Prof. Allman, F.R.S., president, in the chair.—Sir John Lubbock, Bart., read a paper, "Observations on the Habits of Ants," being his fifth contribution on this subject. In continuation of former experiments he finds that ants recognise old acquaintances and attack strangers. Their intelligence is questionable in cases where a thin circle of glycerine bars their access to honey which they have already visited by a paper bridge, for when the latter is taken away they do not pile up a few grains of earth and thus cross the barrier. Spite of the many observers and plentifulness of ants' nests, it is still doubtful how their nests commence. Sir John's experiments show that the workers of *Lasias flavus* will not adopt an old queen from another nest. But on the other hand, the queen of *Myrmica ruginodis* has the instinct of bringing up larvæ and the power of founding communities. As to intimating to each other discovery of food, he considers this does not necessarily imply any power of describing localities, but rather by a simple sign co-workers accompany each other to the treasure. They do not summon their brotherhood by sounds to a repast found by one or another. Their affection for friends is outbalanced by hatred of strangers. A few of each kept prisoners in separate bottles with wide meshed muslin over the mouths, those free outside again and again excitedly endeavoured to attack the latter, but used no means to free the former, their own companions. Further experiments prove scent more than sight guides them in following up food which has been shifted in position after its having been partaken of, and a return to the nest made. Ants avoid light when thrown into their nests, and they then congregate into the darkest corners. Taking advantage of this habit by a series of ingenious experiments—wherein strips of coloured glass, in other instances shallow cells containing coloured solutions, such as fuchsine, bichromate of potash, chloride of copper, &c., were used—Sir John arrives at the conclusion that they are influenced by the sensation of colour, though probably different from the effect produced in man. A predominate preference is given to red, green follows, yellow comes next, while to blue and violet there appears to be a decided aversion. The longevity of ants would seem greater than generally admitted, some specimens of *Formica fusca* being at least five years old.—Mr. Thiselton Dyer made a brief communication on the so-called "rain-tree" of Mogobamba, South America, an account of which we give elsewhere. —Then followed a paper "On the shell of the Bryozoa," by Mr. Arthur W. Waters. The points he more particularly drew attention to were:—The great difference of the young and old cells caused by a constant growth of shell-substance, so that the older zooecia become closed up. This growth progresses at various rates. Passing through the shell are tubes filled with corpuscles of the chylaqueous fluid, which thus become oxidised. The supposed nervous filament of the colonial connection the author believes to be rather for the supply of material from one part of the zooarium to another. He further suggests that the varying thickness of the plates in the walls of the colonial connection should be used as a factor in specific determination, and especially would it be useful in comparing recent and fossil forms. There is a possibility of the avicularia and adventitious tubes being homologous, and helping to maintain the vitality of the colony when the polypides have disappeared.—Messrs. A. G. Agar and C. Berjeau were elected Fellows of the Society.—The President having put the motion, it was unanimously resolved to present an address to Prof. C. T. Ernst von Siebold on his approaching jubilee.

Zoological Society, February 5.—Prof. Mivart, F.R.S., vice-president, in the chair.—Prof. Mivart read a paper entitled "Notes on the Fins of Elasmobranchs, with Considerations on the Nature and Homologies of Vertebrate Limbs," wherein the author detailed his dissections of the fins of Elasmobranchs, which dissections had convinced him that the paired and azygos fins are of similar nature. He represented them all to have resulted from the centripetal growth and coalescence of a primitively distinct series of cartilaginous rays developed in longitudinal folds, of which one was dorsal, one ventral, and two were lateral. He also advocated the view that the limb-girdles result from the further centripetal growth of the coalescing limb-cartilages, which growth seeks a *point d'appui*, the pectoral limb-girdles in fishes shooting upwards and downwards, as well as inwards to obtain a firm support, and, at the same time, to avoid the visceral cavity. He contended that the Archipterygium was not to be sought for in *Ceratodus*, which he by no means regarded as a primitive type of structure, but rather in *Raia* and especially in the ventrals of *Polyodon*. He objected to Gegenbauer's view that the metapterygium formed the limb axis of the cheiropterygium, advocating instead the propterygium, or, if not that, then the mesopterygium. He cited the varying conditions described as evidences of the presence of an innate intra-organic polar force as the main agent in morphological modifications.—A communication was read from Mr. W. A. Forbes, F.Z.S., containing an account of the birds collected by the *Challenger* Expedition at Cape York and on the neighbouring islands. The collection consisted of sixty-one skins referable to thirty-eight species, all, or nearly all, of which belonged to well-known Australian forms, one or two only being uncertain on account of the immature condition of the specimens.—A communication was read from Mr. Francis Nicholson, F.Z.S., in which he gave an account of a small collection of birds made in the neighbourhood of Abeokuta, West Africa. Amongst these was a new species of Finch which was proposed to be called *Amadina sharpei*.—The Rev. S. J. Whitmee, C.M.Z.S., read a paper on the mode of the modifications of anger, fear, &c., in fishes, and on the use of their spines, as observed by him during his residence in the Samoan Islands.—Messrs. F. L. Sclater and O. Salvin gave an account of the collection of birds made by Prof. Steere during his recent journey across South America, from Para to Callao. The 911 specimens obtained were stated to be referable to 362 species, of which five were described as apparently new to science, and proposed to be called *Oryzoborus atrirostris*, *Myiarchus semirufus*, *Furnarius pileatus*, *Capito steerii*, and *Crypturus transfasciatus*.—Prof. Garrod read a note on the anatomy of the Binturong, *Arctictis binturong*, and the fourth portion of his series of notes on the anatomy of passerine birds. —Mr. Howard Saunders, F.Z.S., read a paper on the subfamily of the *Larinæ*, or Gulls, being a monographical revision of the group, which he considered to consist of the genera *Pagophila*, *Rissa*, *Larus*, *Rhodostethia*, and *Xema*, containing altogether forty-nine species. With regard to *Pagophila*, he drew attention to a structural peculiarity which appeared to have been previously unnoticed, *i.e.*, the junction of hallux to the inner toe by a serrated membrane. Mr. Saunders also remarked upon the occasional presence of a small but well-developed hind toe and claw in individuals of the Kittiwake (*Rissa tridactyla*) from Alaska.—A communication was read from Mr. Martin Jacoby, containing descriptions of some new species of phytophagous coleoptera.—Two communications were read from Lieut.-Col. R. H. Beddome, C.M.Z.S. The first gave a description of a new form in the family of Tree-agames from the higher ranges of the Anamallays, proposed to be named *Lophosarea anamallayana*. The second contained the descriptions of some new species of *Uropeltidæ*, from Southern India.

Anthropological Institute, February 12.—Mr. John Evans, D.C.L., F.R.S., president, in the chair.—Mr. H. C. Sorby, F.R.S., read a paper on the various colouring matter met with in human hair. In this paper the author described the manner in which the various coloured substances met with in human hair may be separated and distinguished. Four quite different and well characterised pigments have been obtained, but of these two serve to modify the tints of hair to only a very limited extent. The general colour is mainly due to a black and a brown-red pigment, both of which can be easily obtained in a separate form, and used like water colours, as shown by the numerous drawings which were exhibited. All the varying tints of black, brown, dark and lighter red, and most of the pale tints are easily proved to be due to a variation in the total and relative amounts of these two substances as shown by a series of comparative analyses. The paper concluded with some remarks on the bearing of these facts on ethnology, and with a consideration of the probable explanation of certain changes in the colour of hair occasionally met with, but not yet fully understood.—The Director then read a paper by the Hon. Chas. C. Jones, jun., on bird-shaped mounds in Putnam County, Georgia.

Meteorological Society, February 20.—Mr. C. Greaves, F.G.S., president, in the chair.—Dr. Tripe read a paper on the winter climate of some English sea-side health resorts. The places selected were Scilly, Torquay, Penzance, Guernsey, Barnstaple, Ventnor, Llandudno, Ramsgate, and Hastings, and the climatic features of each were compared with those of London. The results of this discussion may be briefly summed up as follows, viz. :—The mean daily winter temperature of these seaside places, and especially of those situated on the coast of Devon and Scilly, is higher than at London; the mean daily maxima and minima are also higher, and especially the latter; so that the daily and monthly ranges of temperature are smaller; the mean humidity is less, the general direction of the wind about the same, but the number of rainy days and the rainfall are greater at the sea-side. As regards the wind, therefore, the chief point to be especially noticed is the amount of shelter afforded by high land, as at Ventnor, and especially of protection against the stormy and cold winds which ordinarily prevail at the end of February and in March. The soil also should be considered, as heavy rains at gravelly and chalky places are not so objectionable as on clayey ground.—The discussion on this paper was adjourned until the next meeting, which will be held on March 20.—The following were elected Fellows of the Society :—W. C. Baker, W. Berridge, W. M. Burke, Rev. J. A. L. Campbell, Prof. J. Eliot, Lieut. C. S. F. Fagan, C. H. Holden, Prof. H. J. S. Smith, Capt. W. Watson, C. Woollett, and Miss E. A. Ormerod.

Institution of Civil Engineers, February 12.—Mr. Bateman, president, in the chair.—The paper read was on the evaporative power of locomotive boilers, by Mr. J. A. Longridge, M. Inst. C.E.

PARIS

Academy of Sciences, February 18.—M. Fizeau in the chair.—The President gave an account of the funeral of M. Claude Bernard on the 16th inst., and the discourses pronounced by MM. Dumas, Mezières, and others. (These are published in the *Comptes Rendus*.)—Meridian observations of small planets at the Greenwich and Paris Observatories during the fourth quarter of 1877, by M. Villarceau.—On some applications of elliptic functions (continued), by M. Hermite.—Experimental researches on the fractures traversing the earth's crust, especially those known as joints and faults (continued), by M. Daubrée. His object is to show that torsion may account for many of those effects.—Tibio-calcanean resection, by M. Sedillot.—Refutation of M. Pasteur's criticism of his opinion as to the origin of alcoholic yeast and lactic yeast, by M. Trécul.—The vibrations of matter and the waves of the ether in vision, by M. Favé.—Remarks on the satellites of Mars, by M. Roche. He considers the first satellite comparable to the inner ring of Saturn in its origin; it owes its existence (as satellite) to being a little more separated from its planet.—On the law of reciprocity for invariants and covariants of binary quantics, by Prof. Sylvester.—On MM. Clebsch and Gordon's theory of associated forms, by the same.—Presence of magnetic spherules similar to those of atmospheric dust, in rocks belonging to ancient geological periods, by MM. Meunier and Tissandier. If the identity be admitted, we must infer that the layers of the earth's crust contain materials of cosmic origin which fell in a very distant epoch (such particles are found in the Devonian series). It is important to determine where they first appear.—On the vibratory forms of solid and liquid bodies, *à propos* of a note by M. Dubois, by M. Decharme. A claim of priority.—Separation of the non-ferruginous elements of rocks, based on their difference of specific gravity, by M. Thoulet. The specific gravity of most of the essential minerals of rocks varying between 2·2 and 3: these may be separated from each other by immersion in solutions which are without chemical action on them, but whose specific gravity is comprised between the same limits. Such are solutions of iodide of mercury in iodide of potassium. (Details of the method are given.)—On the state of phylloxerised vines in the commune of Mezel (Puy-de-Dôme), by M. Truchot.—Theory of Vesta: perturbations dependent on the first power of the perturbing masses, by M. Leveau.—On the special conditions in the contour of plates, by M. Boussinesq.—On the conditions for a quadratic form of *n* differentials to be transformed so that its coefficients lose a part or the whole of the variables they contain, by M. Levy.—On the summatory formula of Maclaurin and interpolar functions, by M. Genocchi.—On Bell telephones and string telephones, by M. Breguet. By attaching a string telephone (with parchment membrane) to any point of a Bell telephone, one may hear through it a person using a Bell telephone. Several string telephones may thus be connected. A mode of making the string telephone more practicable is described.—On telephony, by M. Salet. A telephone is described in which the movements of the two membranes are absolutely correspondent, the great electric resistance of liquids being utilised for the purpose.—On the ebullition of superposed liquids, by M. Gernez.—Extraction of gallium, by MM. Lecoq de Boisbaudran and Jungfleisch. The authors had obtained 62 grammes of metallic gallium by treating 4,300 kilogrammes of Bensberg blende (the method is described).—Method of volumetric determination of potash, by M. Carnot.—Dissociation of hydrate of chlorine, by M. Isambert. With regard to solubility of chlorine in water, he says that under 9° it is only the hydrate that is formed and dissolved in the water; above this temperature, at ordinary pressure, there is merely a solution of a gas in the water. Air passed through a solution of chlorine under 9° gradually carries off all the chlorine, as if there was solution and not combination.—Action of chloride of benzoyle on leucine, by M. Destrem.—On the identity of muscular inosite and vegetable sugars of the same composition, by MM. Tanret and Villiers.—On the preparation of amylene, by M. Etard.—Experimental researches on the maturation of the grape, by MM. Saint Pierre and Magnien.—On some volatile products of coal-pits set on fire, by M. Mayençon. He examined efflorescences round the fumeroles (the pits were in the Loire valley). The most abundant substances are ammoniacal compounds, arsenic, aluminium, iron, chlorine, and sulphur.—On the conditions of development of liguia, by M. Duchamp.—Sensations of light and colour in direct and indirect vision, by MM. Landolt and Charpentier.—On the geological constitution of the Island of Réunion (first part), by M. Velain. The succession of volcanic phenomena seems to be similar to that at Santorini.—Origin and distribution of limestone in maritime sands, by M. Contejean.—Barometric differences between neighbouring stations according to the direction of the wind (continued) by M. Renou.—On the flash of lightning which caused the burning of the belfry of Toucy (Yonne), on January 25, by M. Roché.

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